Jefferson, Jefferson county: a violent storm from the west passed over this place at 2.45 a. m., on the 23d. Residences, barns, and other out-buildings throughout the storm's path were more or less damaged. The damage to property at Jefferson is estimated at $50,000.

Sussex, Waukesha county: a severe thunder storm, accompanied by hail, passed north of this station at 1.30 a. m. of the 23d. Great damage was done to the grain crops.

La Crosse: a storm of unusual violence prevailed at this place on the afternoon of the 25th. It began at 3.55 p. m., a wind velocity of sixty-three miles per hour being recorded; a greater velocity was attained later, but as the anemometer became unserviceable, the exact velocity is not known. The observer estimates the maximum wind velocity at seventy-five miles per hour. The high wind caused considerable damage in this city and vicinity; in some localities the crops were seriously injured. At a point one mile north of La Crosse, hail fell in large quantities. The storm approached La Crosse from the northwest and passed off to the southeast, its track being narrow.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger points at the various river stations, the highest and lowest stages of July, 1884, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, July, 1884.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:	Ft. In.		Ft. In.		Ft. In.	Ft. In.
Shreveport, Louisiana	29 9	1	18 2	31	7 0	11 2
Arkansas:						
Little Rock, Arkansas	33 0	4	10 6	26	6 3	4 3
Fort Smith, Arkansas		1	2 8	19, 23	*— 1 4	4 0
Missouri:						
Yankton, Dakota	20 0	4, 5	19 11	26	16 10	3 1
Omaha, Nebraska	16 0	4	13 3	26	9 0	4 3
Leavenworth, Kansas	21 0	5, 6	17 3	28	13 5	3 10
Mississippi:						
Saint Paul, Minnesota	14 6	1	4 2	23	2 4	1 10
La Crosse, Wisconsin	18 0	1	4 5	25	1 9	2 8
Dubuque, Iowa	21 10	1	7 8	22	4 3	3 5
Davenport, Iowa	15 0	1	5 10	23	2 10	3 0
Keokuk, Iowa	14 6	1	0 4	25	3 4	3 0
Saint Louis, Missouri	30 0	17	20 10	25	14 11	5 11
Cairo, Illinois	40 0	10	23 2	28	15 6	7 8
Memphis, Tennessee	34 0	1	17 9	30	10 10	6 11
Vicksburg, Mississippi	41 0	1	29 7	31	19 4	10 3
New Orleans, Louisiana†	—2 6	1	— 4 6	31	— 8 4	3 10
Ohio:						
Pittsburg, Pennsylvania	20 0	30	8 4	26	0 4	8 0
Cincinnati, Ohio	50 0	1	15 5	26, 27	4 10	10 7
Louisville, Kentucky	24 0	2, 3	7 0	25,27,28	3 2	3 10
Cumberland:						
Nashville, Tennessee	42 0	1	8 2	27, 28	1 10	6 4
Tennessee:						
Chattanooga, Tennessee	33 0	1	8 4	25	2 7	5 9
Monongahela:						
Pittsburg, Pennsylvania	29 0	30	8 4	26	0 4	8 0
Savannah:						
Augusta, Georgia		6	16 1	27	6 0	10 1
Willamette:						
Portland, Oregon		1	17 7	31	7 8	9 11
Sacramento:						
Red Bluff, California		1	2 5	29,30,31	1 2	1 3
Sacramento, California		1	19 4	31	11 6	7 10
Mobile:						
Mobile, Alabama		23, 27	16 11	4, 5, 17	15 0	1 11
Colorado:						
Yuma, Arizona		13, 14	27 6	30, 31	20 0	7 6

* Below bench mark. † Below high-water mark of 1874 and 1883.

All stations on the Mississippi river, with the exception of Saint Louis, Missouri, and Cairo, Illinois, report the highest stage of water on the 1st; at Cairo and stations northward the lowest water was observed from the 22d to 25th, and south of Cairo from the 28th to 31st.

The Missouri was highest on the 4th and 5th; it was lowest at Yankton, Dakota, and Omaha, Nebraska, on the 26th, and at Leavenworth, Kansas, on the 28th. At Yankton, it was within one inch of the danger-line when at its highest stage, on the 4th and 5th.

The Ohio river remained low during the month. At Portsmouth, Ohio, navigation was suspended on the 25th, on account of low water; on the 28th there were but three feet and ten inches of water in the channel. At Pittsburg, Pennsylvania, the river reached a height of eight feet and four inches above low water, on the 30th, permitting most of the coal barges, which had been detained for the past month, to proceed down the river.

The observer at Nashville, Tennessee, reports that navigation in the Cumberland river was suspended on account of low water, on the 16th.

FLOODS.

Yuma, Arizona: portions of the Southern Pacific railroad bridge over the Colorado river were washed away on the 1st and 3d.

Fayetteville, Washington county, Arkansas: reports from Drake's creek, Madison county, state that a "cloud-burst," extending over a radius of twenty miles, occurred on the morning of the 6th. White river, and Brush, Drake's, and Richland creeks overflowed, causing much damage. Six persons were drowned by the overflow of Richland creek; several houses at Huntsville were swept away and the crops in many places were ruined.

Chesterfield, Chesterfield county, South Carolina: a very heavy fall of rain occurred during the night of the 10–11th, which caused the streams in this vicinity to overflow. Numerous mills and bridges were washed away and other damage caused. At Cheraw, the rainfall is reported to have been the heaviest known for several years, and mills and bridges in that locality were washed away. The railroad between Cheraw and Wadesborough was badly damaged, causing delay of trains.

Baltimore, Maryland, a very heavy rainfall occurred on the afternoon of the 11th, 3.75 inches water having fallen in less than two hours. A large amount of damage was caused by the flooding of the lower floors and cellars of buildings; in some portions of the western part of the city the water covered the streets to a depth of five feet.

Lexington, La Fayette county, Missouri: the heavy rains on the 24th, caused serious washouts along the line of the Missouri Pacific railroad. At Concordia, Davis creek overflowed and caused an extensive break in the road at that point.

Columbus, Lowndes county, Mississippi: more than four inches of rain fell at this place on the 28th, causing damage to the growing crops in bottom lands.

Piedmont, West Virginia: rain fell continuously from 10 a. m. of the 28th, until 5. a. m of the 29th, causing one of the most destructive freshets that has ever occurred in this vicinity. A "cloud-burst" is reported to have occurred at the head of Castle run, near Lonaconing, Allegheny county, Maryland, partially submerging that town. George's creek, a small stream, was much swollen and horses and cattle pasturing along its banks were drowned. At Barton, Allegheny county, twenty houses were washed away and three persons were drowned. At Western Port, Allegheny county, where George's creek empties into the Potomac river, a part of the town was flooded and three houses were washed away. The Cumberland and Pennsylvania railroad was badly damaged.

HIGH TIDES.

Eastport, Maine, 21st.
Scott's Hill, North Carolina, 21st, 22d.
New River Inlet, North Carolina, 22d, 23d.

LOW TIDES.

Eastport, Maine, 9th.
Indianola, Texas, 1st, 2d, 4th, 5th, 7th to 11th, 26th to 31st.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors during July, 1884, with the average depth at which the observations were made and the mean temperature of the air at the several stations, are shown in the following table. The highest observed water temperatures are: 96°.1 at Indianola, Texas; 89°.7 at Key West, Florida; 88°.7 at Galveston, Texas; 88°.5 at Cedar Keys, Florida; and 88°.2 at Augusta,

Georgia. The lowest observed water temperatures are: 46° at Marquette, Michigan; 46°.1 at Eastport, Maine; and 50°.2 at Duluth, Minnesota. The smallest ranges are: 2° at Baltimore, Maryland; 2°.5 at Eastport, Maine; 2°.6 at Jacksonville, Florida; and 2°.8 at New London, Connecticut. The largest ranges are: 15°.1 at Escanaba, Michigan; 16°.3 at Duluth, Minnesota; and 17° at Marquette, Michigan.

Temperature of water for July, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.		Mean temperature of the air at station.
	Max.	Min.		ft.	in.	
	°	°	°			°
Atlantic City, New Jersey	73.0	68.0	5.0	2	11	70.6
Alpena, Michigan	69.8	62.5	7.3	12	4	61.3
Augusta, Georgia	88.2	75.8	12.4	8	8	80.9
Baltimore, Maryland	78.0	76.0	2.0	9	8	75.1
Block Island, Rhode Island	65.3	59.6	5.7	8	0	66.0
Boston, Massachusetts	65.6	57.0	8.6	21	0	68.0
Buffalo, New York	70.8	64.3	6.5	10	0	64.9
Canby, Fort, Washington Territory	65.7	61.1	4.6	15	5	58.6
Cedar Keys, Florida	88.5	79.9	8.6	10	9	82.6
Charleston, South Carolina*	87.4	78.1	9.3	42	1	82.2
Chicago, Illinois	71.2	63.7	7.5	8	6	69.2
Chincoteague, Virginia	82.0	70.4	11.6	3	11	73.2
Cleveland, Ohio	73.4	69.1	4.3	14	0	69.0
Detroit, Michigan	72.2	65.9	6.3	23	6	69.8
Delaware Breakwater, Delaware	73.5	63.6	9.9	9	7	72.2
Duluth, Minnesota	66.5	50.2	16.3	9	11	62.4
Eastport, Maine	48.6	46.1	2.5	14	11	58.6
Escanaba, Michigan	67.6	52.5	15.1	18	9	62.6
Galveston, Texas	88.7	82.0	6.7	11	9	85.2
Grand Haven, Michigan	78.0	67.0	11.0	19	0	66.9
Indianola, Texas	91.6	84.5	7.1	8	6	83.5
Jacksonville, Florida	87.0	84.4	2.6	18	0	82.9
Key West, Florida	89.7	85.9	3.8	16	7	85.0
Mackinaw City, Michigan	65.3	57.7	7.6	10	0	61.3
Macon, Fort, North Carolina	83.2	77.5	5.7	7	7	79.1
Marquette, Michigan	63.0	46.0	17.0	10	0	59.9
Milwaukee, Wisconsin	65.2	57.1	8.1	8	0	65.8
Mobile, Alabama	87.4	78.1	9.3	16	1	86.1
New Haven, Connecticut	72.6	66.2	6.4	16	4	67.8
New London, Connecticut	65.0	62.2	2.8	13	1	67.5
New York City	72.1	67.6	4.5	16	4	70.1
Norfolk, Virginia	80.6	71.1	9.5	16	5	77.4
Pensacola, Florida	83.5	79.3	4.2	17	5	86.5
Portland, Maine	59.4	53.2	6.2	16	7	67.5
Portland, Oregon	70.1	65.4	4.7	61	5	63.5
Sandusky, Ohio	78.0	70.0	8.0	11	0	71.2
Sandy Hook, New Jersey	71.0	66.0	6.0	1	10	71.0
San Francisco, California	62.9	56.2	6.7	39	3	60.0
Savannah, Georgia	84.5	76.0	8.5	10	6	82.4
Smithville, North Carolina	84.0	78.6	5.4	11	1	83.3
Toledo, Ohio†	76.6	72.1	4.5	11	7	71.6
Wilmington, North Carolina	83.0	76.2	6.8	18	8	79.7

* Record for 23 days. † Record for 30 days.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.09 per cent. The percentages for the four elements are: Weather, 87.46; direction of the wind, 77.15; temperature, 86.05; barometer, 94.30 per cent. By geographical districts, they are: For New England, 78.82; middle Atlantic states, 86.25; south Atlantic states, 88.82; eastern Gulf states, 83.51; western Gulf states, 90.23; lower lake region, 84.00; upper lake region, 83.68; Ohio valley and Tennessee, 85.47; upper Mississippi valley, 84.08; Missouri valley, 72.98; north Pacific coast region, 87.10; middle Pacific coast region, 98.39; south Pacific coast region, 98.39. There was one omission to predict out of 2,997, or 0.03 per cent. Of the 2,996 predictions that have been made, thirty-nine, or 1.30 per cent., are considered to have entirely failed; one hundred and thirty-four, or 4.47 per cent., were one-fourth verified; three hundred and fifty-four, or 11.82 per cent., were one-half verified; six hundred and forty-one, or 21.40 per cent., were three-fourths verified; 1,828, or 61.01 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During July, 1884, one hundred and twenty-two cautionary signals were ordered. Of these, ninety-seven, or 79.51 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Twenty-three cautionary off-shore signals were ordered, of which number fourteen or 60.87 per cent., were fully justified both as to direction and velocity. Twenty-three, or 100 per cent., were justified as to direction; and fourteen, or 60.87 per cent., were justified as to velocity. One hundred and forty-five signals of all kinds were ordered, one hundred and eleven, or 76.55 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore six were changed from cautionary. Five signals were ordered late. In one hundred and six cases, winds of twenty-five miles or more per hour were reported for which no signals were ordered; many of these were high local winds or strong sea breezes.

Professor T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for July, 1884, makes the following statement:

> The verification of railway signals during July was as follows: for temperature, 93 per cent.; for state of the weather, 76 per cent.
>
> The railway weather signals are now in use on all of the divisions of the Hocking Valley and Toledo railroad. It is hoped that they may be placed on other important lines very soon.
>
> At the request of the Board of Trade of the City of Columbus, the signals will be displayed in their rooms in the City Hall, and arrangements are in progress for their display at one or two prominent points in the city.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays occurred during July as follows:

Eastport, Maine: a brilliant auroral arch was seen from 1 to 2 a. m. of the 25th; the display consisted of a segment of dark haze surmounted by a whitish arch, and waves of light advancing to and receding from the zenith. A similar display was also observed from 9.20 to 11.30 p. m. of the same date.

Mount Washington, New Hampshire: an aurora, consisting of luminous beams extending upward 30°, was visible from 10.10 p. m. of the 3d until midnight. A faint auroral arch was also visible from 8.57 p. m. of the 25th to 1.20 a. m. of the 26th.

Point Judith, Rhode Island: a faint aurora was visible from 8.40 to 9.45 p. m. on the 14th, consisting of a diffuse light of pale straw-color, extending from north-northwest to north-northeast, and to an altitude of 30°; slender beams were observed from 9 to 9.20 p. m.

Portland, Maine: a faint auroral light was visible from 11.30 p. m. of the 19th to 12.20 a. m. of the 20th. On the 25th an irregular auroral arch with streamers extending to the upper edge of "Ursa Major" was observed from 9.20 to 11.50 p. m.

New Haven, Connecticut: an auroral glow, with a few faint streamers, was observed from 9 to 10.30 p. m. of the 26th.

Cambridge, Massachusetts: an auroral arch with streamers was observed about 9.15 p. m. on the 13th. A display was also observed on the evening of the 25th, and displays were suspected on the evenings of the 2d and 20th.

Rochester, New York: a faint auroral display, lasting only a few minutes, was observed at about 10 p. m. of the 19th. On the 25th a display covering the sky from northwest to northeast, and to an altitude of 45°, was observed from 9.15 to 11.30 p. m.

Oswego, New York: a faint auroral display, resembling the twilight, was observed in the north from 10 p. m. of the 19th until the early morning of the 20th.

Cresco, Iowa: faint auroral displays were observed on the evenings of the 15th, 19th, and 25th.

Monticello, Iowa: faint aurora from 9 to 10 p. m of the 9th.

Milwaukee, Wisconsin: a faint auroral light was observed in the north from 8.30 to 10 p. m. on the 13th, the display consisting of a luminous glow with slender beams shooting towards the zenith.

Alpena, Michigan: an aurora was visible from 8 to 11.40 p. m. of the 13th, consisting of a diffuse light in the north, from which pale streamers extended towards the zenith.

Escanaba, Michigan: a faint aurora was visible from 9.35